Journal of the Society of Arts.

FRIDAY, APRIL 24, 1857.

NOTICE TO MEMBERS AND INSTITUTIONS.

The prizes awarded by the Society's Examiners to the successful Candidates at the June Examination in London will be distributed on the morning of Tuesday, the 23rd of June, at the Society's House in the Adelphi.

The Society's Annual Dinner will take place at the Crystal Palace in the afternoon of the same day.

The Sixth Annual Conference of the Representatives from Institutions in Union with the Society, is appointed to be held at the Society's House on Wednesday the 24th of June.

The Annual General Meeting for receiving the report of the Council and the Treasurer's statement of receipts, payments, and expenditure during the past year, and also for the Election of Officers, will, in accordance with the Bye-Laws, take place at 4 o'clock on the same day.

CONVERSAZIONE.

The Society's Second Conversazione will take place on Wednesday evening, the 6th of May. On this evening the Pictures and Sketches of the late Thomas Seddon, Esq., will be exhibited, and an address will be delivered by John Ruskin, Esq. Gentlemen only are invited to this Conversazione. Cards have been issued to the members. Any member not having received his card is requested to communicate with the Secretary.

ART TREASURES EXHIBITION.

The Council of the Society of Arts have appointed a Committee to make arrangements for organizing a visit of the members to the Art Treasures Exhibition at Manchester.

EXHIBITION OF INVENTIONS.

The Society's Ninth Annual Exhibition of Inventions was opened on Monday, the 23rd ult. The Exhibition will be open every day till the 23rd of May, from 10 a.m. to 4 p.m., and is free to the members and their friends. Members, by tickets or by written order bearing their signature, may admit any number of friends.

NINETEENTH ORDINARY MEETING.

Wednesday, April 22, 1857.

The Nineteenth Ordinary Meeting of the One Hundred and Third Session was held on Wednesday, the 22nd inst., Dr. Lyon Playfair, C.B., F.R.S., in the chair.

The following Candidates were balloted for and duly elected members of the Society:—

Anderson, Alfred George	Odling, Dr. William
Evans, Thomas William	Paget, Charles, M.P.
Hawkes, William	Philbrick, F. A.

The paper read was

ON DISINFECTANTS.

By R. Angus Smith, Ph. D., Manchester.

The word infection has from early times been used in a bad sense, although it means only the power by which one body acts in its own peculiar method on another, or the action itself. In the history of words we have the thoughts of the men who formed them. This word shows the ancient method of viewing the subject to have been little different to our own. The word disinfection took its origin I imagine in France during the last century, at least I don't remember it sooner; it is applied to the removal of all disagreeable gases and odours, as well as to the decomposition which produces them; it therefore includes deodorising. The use of the word in this manner is quite in accordance with the opinion held from the earliest ages, that the infection of fever or plague was either the same as, or distinctly allied, to these gases. In ancient times the prevention of corruption was more studied than actual disinfection; bodies preventing corruption are properly antiseptics, and this is the name under which, during the last century, and great part of this, disinfectants have been chiefly classed in England.

As I propose to view the subject historically and practically, as well as to some extent, although the subject is very dark, theoretically, I shall be obliged to pick out those points only which seem to me most interesting or most novel.

One of those points which sanitary reformers have much attended to of late, viz., abundance of room with a clear open current of air around our houses, was provided for at an early period in the Eastern Empire, (Codex Just., Lib. viii., Tit. 10,) where no one was allowed to stop the view from windows looking towards the sea, so that except in kitchens and outhouses, the early inhabitants of Constantinople had ventilation secured. Many attempts were also made in Athens and Rome to have wider streets, although private interests continually interfered in both cities to prevent public benefit. In Rome the authorities were not able to make the smallest width of a street more than five feet, whilst in Constantinople it was ordered by Zeno to be twelve.

The use of drainage as a disinfectant, is from time immemorial, or the days of Hercules who saved the Elians from pestilence by draining their marshes. Many instances of this occur in early times; it is even probable that it was known before the time at which it has been supposed Hercules existed. Hippocrates studied these matters, and takes such a wide view of them that there is no doubt of his having received much of his cultivation from a fund of knowledge which one man could not accumulate. He is perfectly aware of the infectious nature of certain districts and of certain winds, and his views on the situation of towns, with regard to heat and cold, moisture, dryness, and exposure to winds, show a width of observation which for a long time the world has contracted into much smaller limits.

The disinfection of the streets and sewers was the duty of a high officer at Rome. "The prætor took care that all sewers should be cleansed and repaired for the health of the citizens, because uncleansed or unrepaired sewers threaten a pestilential atmosphere and are dangerous," (Digesta Just., Lib. 43, Tit. 23); it was forbidden also to throw refuse on the roads, (Tit. 9). This cleanliness

seems to have come from the East, where now only the ceremonial part remains, and the streets of Jerusalem were said to be swept every day, although a place not considered greatly advanced in the arts. There can be no question that in these respects the world had at one time receded very much, and moderns, whilst gaining ground for themselves, have been compelled also to struggle for much that ignorance and idleness had lost. In the 12th century Paris had neither a pavement nor street sweepers, nor had it even a place into which to carry the refuse. We read in the French Dictionary of Hygiène, by Tardieu, that the filth of the streets stirred up by the horses' feet so disgusted Philip Augustus, that he ordered pavements to be made; nor was London any better. We have only to imagine the condition of certain small towns of modern times, to have an idea of the state of great capitals left in a neglected condition. Even up to last century, we read of dangerous riots in Paris, caused by the proximity of great masses of filth, which an indignant public refused any longer to endure.

Many arts have undoubtedly been lost, because in early times care was not taken to make them so well known and so necessary to comfort, that the destruction of a capital city or even of an empire, would be unable to root them out of the minds of the remaining population.

The use of antiseptics, as applied to the dead, has been known longer than any authentic history which books have handed down, and some of the processes described to us by persons who saw them carried on in a manner transmitted to them from much earlier dates, show us that in the chemical arts there has been a loss of information, which has only been reproduced after much search and difficulty. I shall not describe the process of embalming, it has become familiar to all; but one or two points are interesting. They used resins, pitch or tar, and aromatics. They washed the body with natron and cedar oil. This natron or nitre was, in all probability, as Hoefer supposes, caustic soda. It dissolved portions of the body, and it may be said to be well known that caustic soda was manufactured in Egypt. Pliny says (Book 31 c. 10) that the nitre was dried till it was light and spongy, and the water of crystallization being driven off by the sun, the fine powder produced in this way from carbonate of soda crystals was obtained.

When caustic soda was made, they seem to have sold the lime and soda together, as it is said that the "pure was very easily dissolved, and the impure very pungent," meaning, I suppose, that the impure was not dissolved on account of the lime. With the soda, oil of cedar was used. This has been called, with good reason, turpentine, which has strong disinfecting properties, but the word has evidently been used in many senses, as there are many liquid products to be obtained from cedar. It is used of the first liquid from the distillation of wood; and Berzelius, for that reason, says that the Egyptians used the pyroligneous acid which, containing some kreasote, was a great antiseptic. But mixing this with caustic soda would be of little value, nor is it probable that they would add a volatile liquid like turpentine along with soda. It is expressly said that the pitch was reboiled, or in other words, the tar was boiled and distilled into fleeces from which the product was pressed. In doing this, the light oils or naphtha would be evaporated and the heavy oil of tar containing the carbolic, phenic, or phenylic acid would remain. It was also called *picenum*, as if made of pitch, or *pissenum* and *pisselaeum*, or pitch oil, a more appropriate name than that of Runge's, who called it carbolic acid, or coal oil; and still more appropriate philologically than the most recent, which, by following up a theory, has converted it to phenic acid. The distillation was made in copper vessels, and must have been carried very far, as they obtained a "reddish pitch, very clammy and much fatter than other pitch." This was the anthracene, chrysene, and pyrene of modern chemists. The remaining hard pitch was called *palimpissa*, or second pitch, which we call pitch in contra-distinction to tar. By the second pitch was sometimes meant the residuum in the copper still, and sometimes the product of distillation. A good deal of confusion therefore results. The pitch oil was resiny, fat, and of a yellow colour, according to some descriptions. They do not seem to have separated the last products well. This kreasote they used for toothache—a mode of disinfecting living bodies—as well as for skin diseases of cattle, for which it has been found valuable.

Of course this information is not got in so many words from Pliny, but it is remarkably clear, and if the classics were read with the eye of a chemist, no doubt many more of the arts would be found. As Pliny got his information second-hand, he did not write so clearly as to be understood by a person not previously acquainted with the details. It would occupy all the time of this meeting to examine every passage and show the reasons for these conclusions.

Another mode of using kreasote may be seen in the circumstance that hams were hung up on the roof and apparently smoked.

One of the earliest and most valued disinfectants was sulphur, used at least in Greece and Italy. When Ulysses killed the suitors, after putting matters in order he called for sulphur to "sulphurise" the palace, by burning the sulphur and so causing acid fumigations. It was so valued as to become a sacred method of purification; and its name in Greek, which signifies divine, was probably connected with its sacred character, although it is quite probable that its connection with volcanic districts may have suggested its solemn designation. It was burnt in lustrations as a religious ceremony; the shepherds yearly purified their flocks and herds with it, and averted the plague from them, and it lost none of its virtues in their eyes when they saw the effect which it had in purifying and bleaching their wool. In all nations the burning of incense may have had originally a connection with physical purity or disinfection, but as far as I know this act of Ulysses is the earliest instance of direct fumigation for sanitary purposes. It was probably, also, partly religious. It seems to have been a common practice then. The Italians have been obliged to re-discover the use of sulphur for their vines, and they find its value, although it takes away the fine flavour of their wines for a season, probably because it is carried to excess.

Honey was used as a preservative by the ancients, as sugar now; it is even said to have been used as an antiseptic in preserving the dead, and for specimens as alcohol with us, as we read of a centaur which was born in Thessaly, but, dying the same day, was sent preserved in honey to a museum, as we should call it, in Egypt.

They used bitters to preserve new wines, somewhat as we do hops.

Fire was used in various ways as a purifier. It was used directly in times of plague for purifying and renewing the air of towns, accompanied with perfumes and flowers, as well as vinegar and various aromatic substances, amongst which may be put pepper, mustard, and so on. The use of perfumes was carried to an extent not dreamed of here, evidently a substitute in many cases for refined cleanliness, but not entirely, if originally so, because it is constantly associated with the most refined habits, and generally with the purification of the bath.

Water, as a principal agent in disinfection, was highly appreciated by the ancients, and the most violent exertions of these late years have only put us on a level with the provincial towns of the Roman empire. Fire, as a great purifying agent, has everywhere had a prominent place, in some respects the most prominent, as it deserves to have, so that purification by fire may signify now, as it did of old, both in a physical and moral sense, the utmost state of disinfection. The fine observers on the Mediter-

ranean had connected the departure of disease with the warming and drying influences of the sun, although it was also observed that the warmth and moisture of a south wind " tended to corruption," which was reversed by the invigorating north wind. In these opinions we have their knowledge of the disinfecting agency of heat and cold. They knew, too, from experience, that disease might be prevented by blocking up the windows towards an infected district, and opening others with a better view. Their use of drying in the enbalming process is another indication of their knowledge of the agency of water and of heat.

That great disinfecting agent, the soil, was not forgotten, and, indeed, all nations have used it, more or less, for their dead. To bury is generally the most ready mode of disposing of dead bodies. When the power of the soil is complete, we look in amazement at the amount of dead which our burying grounds absorb before they themselves become pestilential.

Whilst the ancients used various methods of preventing unwholesome decomposition in dead matter, they did not neglect the important object of putting a stop to the analogous decomposition in living matter, often the occasion of much pain. They had as many plans of curing toothache as we have, real and fancied; but Pliny mentions a method of removing a tooth without pain, by first making it anæsthetic with white hellebore. To this pitch we have only lately attained. Although we may not be able to use their processes, we must not deny them. The description is not very exact, but the mere idea proves advance. A note which I sent to the Athenæum some years ago shows this more distinctly. Phillip Beroaldo, in his annotations on Galen, says, " the kind of fishes called by Galen and other writers *narkê*, the translator has very absurdly termed *stupor*, because in Greek *narkê* does at other times mean stupor, whence the term in medicine, narcotics, which we use in cutting off limbs, producing a stupor so that *the amputation is made without pain*." He speaks in the fifteenth century, as if the subject were well known, whilst to us it is a great novelty, which we imagine to have been waiting till such time as chemistry should discover the proper materials.

I have brought forward anæsthetics because they are included in the classification I intend to make. In taking leave of the ancients with these few allusions to their skill, I am reminded again that these arts had been lost, and that this is a Society whose duty it is so to spread knowledge by the wisest means as to put it as much as possible out of the power of any political change, to annihilate those numerous and important arts whose names are scarcely heard of in history, but which are absolutely necessary for the existence of a great civilization. I hope it will meet with success. The arts advance slowly, and they die readily. In many respects they advance more slowly than sciences. Their progress does not depend on individuals merely. If not supported by a considerable community they cease; sometimes they require the support of a whole nation. If, at any time, any art should cease to be cultivated, it is important that, at least, a knowledge of it should not perish. In our manufacturing districts inventions are being made weekly, almost daily, that have been made by others in past days, but of which a record either has not been kept, or has been very difficult of access. For this reason I have always held it as the first duty of Manchester to obtain for herself a permanent museum of those arts which have made her great, and on which her prosperity depends—a museum which shall include all those inventions which her ingenious sons have made so profusely. We go to Paris, and find machines, invented here, but preserved there with the greatest care, as monuments of the ingenuity of the race, whilst with us, too frequently, everything is lumber in the arts but the newest pattern. I consider that such an institution lies within the strict duties of Manchester and all the manufacturing districts, at the same time that it ought also to have schools where the people may learn those sciences, which they neglect, but on which they entirely depend. Agriculturists have their own colleges and professors for themselves, at the Universities. There are no such institutions to cultivate manufactures. These institutions it is, I believe, our duty to establish; but a gallery of fine arts has carried the day—a much more alluring object, and such as I shall enjoy more than that proposed by me —but, at the same time, it must be remembered that the *intellectual* arts must flourish amongst us ere the æsthetic arts can be enjoyed.

Bodies undergoing decomposition are under the agency of forces not well understood. The living body is undergoing continual decomposition and recomposition, but an instance of decomposition which seems spontaneous in many cases, is best seen in fermentation. Here sugar breaks up into two bodies; and having begun goes on rapidly. It seems only to require a slight impulse to begin, and it starts off with great rapidity. We do not know the nature of this impulse, but the sugar is in a decomposing, breaking-up state, and it would be well if we had a scientific and universal name for this, instead of each nation having its own. Berzelius proposed *catalysis*, but added explanations which made it a new force. There are many instances of decomposition analogous, and a different force may exist in each. It was, therefore, in the opinion of chemists a mistaken view of the subject. Still, the facts are true, and the name given by Berzelius is very descriptive. It describes a body in the state of breaking up, where chemical election does not appear to act. The word applies to living bodies, or to dead bodies as in putrefaction, or to vegetable decomposition as in fermentation. As the impulse to begin is apparently small, the introduction for example of a very little oxygen, so the rapid arrest of the process is remarkable and equally unaccountable. In the higher forms of this catalytic action, viz., in life, we find it arrested by minute doses of vapour inhaled, or of certain substances swallowed, or of other substances put in contact with the blood. We find also different animals affected differently, for example, by the poison of the Tsetsec fly in South Africa, which kills horses and oxen, but is only a minor inconvenience to man. We find the same substances that destroy life acting against fermentation to a large extent, such as mineral acids, among which especially are nitric and sulphurous; also organic acids when very strong, metallic salts, strong alcohol, kreasote, empyreumatic substances, and ethereal oils or many compounds containing much carbon and hydrogen; but vegetable alkaloids, which act so powerfully on animals, have only a small influence comparatively on fermentation.

Now coming to the next stage of decomposition or catalysis of dead matter, we find that those same substances which act on living matter are capable of acting as antiferments, antiseptics, and disinfectants. They are substances which put a stop to the catalysing condition. It would be well for us to have a general word for this class of substances. I propose *colytic*, from the word κωλυω, to arrest, restrain, or cut short. Those bodies which put a stop to chemical decomposition would be called *colytics*, and the action *colytic action* or *colysis*. But it would be unwise to speak of the colytic force as distinct, even if we did not know that it is manifold, as in designating anything not well known we should leave room for clearer views. A colytic force manifests itself towards living persons in poisons, anæsthetics, anodynes, and hypnotics. In vegetable or dead animal matter as antiferments, antiputrescents, antiseptics, and disinfectants. The disinfection of some vapours is, however simple chemical decomposition. We recognise in all these forces an analogous action on which I shall make a few remarks, tending towards a theory which seems to me somewhat to remove obscurity from the subject.

Oxygen seems to begin the state of putrescence; in

soldering meat in airtight vessels not a trace of air must be left behind. On allowing one bubble of oxygen to enter grape juice ready to ferment, the process begins, and is continued without more being added. Liebig said that "no other explanation (of this force of decomposition in fermentation and putrefaction) can be given, than that a body, in the act of combination or decomposition, enables another body, with which it is in contact to enter the same state." He says that the active atoms of one body influence those of another, so that, when once it is begun, "the statical equilibrium" being suspended, the motion is transmitted through the mass; the explanation is mechanical, and one of his analogies used is the crystallization caused by shaking saline solutions. But the mind requires to view the subject more nearly. Suppose a particle of oxygen to touch the matter ready to ferment, it removes a particle of carbon or carbonic oxide; the atoms of carbon or hydrogen, or both, with which it was united, are set free—they must follow their affinities. If the mass were neutral, having no sign + or — before it, oxygen at once, by its action, changes one sign to +. The sign changed to plus, or the atom containing it, converts the one next it to minus, and so the chemical action is continued through the mass; this is according to known and recognised theories, and without mysteries being involved under the word catalysis; we have a similar action in setting up bricks on end in a row, and causing the fall of tons, if we please, by the initial force of a few ounces. We have a similar instance of change of sign when water is decomposed, and hydrogen comes off at a distance from oxygen. This change of sign is transmitted through a long line of atoms; I do not care to call it electric, although it agrees with the electro-chemical theory; it is enough if we recognise the attraction and repulsion which are needed and represented by plus and minus. Now, this same action, which is referred to decomposing bodies, may be referred to the colytic action where decomposition is arrested. In this case a substance with slight affinities may unite with any product of decomposition, removing either the negative or positive element so entirely as to render the remainder neutral, or in equilibrium. It is enough to suppose the inclination to unite, although the act may be long delayed. If we call either the decomposition or arrest, by the name of *contact* action or the action of *presence*, we express a theory, viz., that mere contact or presence is enough; now, this is unfair, because we feel persuaded of its insufficiency. If we use the words *catalytic* and *colytic*, we express a fact without a theory.

The modern history of disinfectants began, conveniently speaking, in the 17th century. Boyle worked a good deal on kindred subjects, and showed the influence of air and of heat and cold. In 1732, Dr. Petit made experiments on antiseptics; he used small portions of mutton, and found how long each antiseptic preserved a piece untainted: he came to the conclusion that astringents were the best, and that their action was similar to drying. He illustrated it by saying that, as corruption comes from the separation of the particles, so preservation is attained by contracting them, or drawing them closer, as is done by dry air and astringents.

In 1750, Sir John Pringle wrote his "Experiments on Septic and Antiseptic Substances, with Remarks relating to their use in the Theory of Medicine." He recommends salts of various kinds, and astringent and gummy resinous parts of vegetables and fermenting liquors. Dr. Macbride followed him with numerous experiments. He speaks of acids being the long-prescribed agents as antiseptics. He found that even diluted to a great extent they were powerful; that alkalies were antiseptic; that salts in general have the same quality; also "gum-resins such as myrrh, asafœtida, aloes, and terra japonica;" also "decoctions of Virginian snake-root, pepper, ginger, saffron, contrayerva root, sage, valerian root, and rhubarb, with mint, angelica, senna, and common wormwood." Many of the common vegetables also were included as to some extent antiseptic, such as horse radish, mustard, carrots, turnips, garlic, onions, celery, cabbage, colewort. Lime was found to prevent but not to remove putrefaction. Animal fluids, he observes, will remain for a long time without putridity if kept from the air. He says that astringent mineral acids and ardent spirits "not only absorb the matter from the putrescent substance, but likewise crisp up its fibres, and thereby render it so hard and durable that no change of combination will take place for many years." To add molasses to this list, will complete fairly a description of his opinions.

In 1767 an essay recommending nitrate of potash in ventilation received the recommendation of the Academy of Dijon. How this was applied, the Dictionnaire de Médecine, from which I have taken it, does not say.

In 1773, Guyton Morveau proposed fumigation with muriatic acid vapours as a mode of disinfecting hospitals, &c. This was hailed as a great discovery at the time, and practically acted as a valuable step. He adduces the testimonials of men deservedly great in our estimation, to prove the excellence of his method. It was even stated that the fumes were not disagreeable. He was much aggrieved when Dr. Carmichael Smyth used nitrous fumes at Winchester, in 1780, and afterwards in the Fleet, without giving him the credit of the discovery of acid fumigation. And still more was he hurt when Parliament, in 1802, voted £5,000 to Dr. C. Smyth. But he tells us that *even* in England he found men to do him justice. Let us do him justice; he seems to have been the first that introduced acid fumigations in modern times; still, the disinfecting power of acids was known before, although not used in the same manner in modern times. But where were our classical scholars, and why did they neglect the ventilation by acid fumes, so frequent in Greece and in Rome, and distinctly written in their beloved Homer? Muriatic acid is very inferior as a disinfectant, and even in Guyton Morveau's mind it soon gave way before chlorine, which was introduced as a fumigating agent in 1791-2 by Fourcroy. This last gas was introduced into England by Dr. Cruikshank. All these acids are very violent, and fitted only for extreme cases, which ought not to be allowed to occur. Chlorine may be excepted; it may be used with advantage in minute quantities, at least for limited periods. The slight amount arising from chloride of lime seems to produce sufficient effect, although of course, not enough for extreme cases. When applied to centres of putridity, such as sewers and cesspools, the great objection to it is, that it destroys the ammonia, sending off the nitrogen as a not very pure gas. It soon acquires much moisture, loses its power, and gives a very unpleasant odour to the hand when touched. Its destruction of manures is, however, the principal objection to it.

Chlorine acts by uniting with hydrogen, acids by uniting with the compounds of hydrogen, water and ammonia. Chlorine decomposes the sulphur and phosphorus compounds of hydrogen. It will even dissolve a piece of flesh, so as to form a transparent liquid, giving off little odour. It may also be looked upon as an oxidising agent, removing the hydrogen and leaving the oxygen of water free to act, and as it is then in a nascent state, we have, as it were, a concentrated oxygen or air fitted to destroy animal matter by its active power of combination.

This latter effect may also be ascribed to sulphurous acid. It has generally been called a deoxidising or reducing agent, but it acts also as an oxidising agent of great power when it decomposes the sulphur compound of hydrogen, by giving up its oxygen. Of this it possesses two atoms, so that it ought to have double the effect of chlorine.

The power of oxygen as a putrefactive agent, is closely related to its disinfecting agency. The first action is

to cause putrefaction, the second to cause oxidation or disinfection. Hildenbrand found that meat in a vessel of oxygen putrified in eleven hours. By the consent of all times the contact of putrid matter assists it, although some have demurred to this, mentioning that sulphide of ammonium prevents putrefaction. But this only happens when the liquid is very strong. Berzelius says that animal liquids may be long prevented from decay by occasional heating to 100° C., in order to remove the oxygen when absorbed. Another writer says 60° C. or 140° F. Sweeny preserved meat in water by first boiling out the air, cooling it, covering it with a stratum of oil to keep out air, and adding iron filings to absorb what might have been allowed to enter. Meat remained sweet in this way for seven months. Leuch added a covering of oil also, but used unboiled water and sulphur instead of iron filings. Meat was preserved in this way for two months.

Putrefaction is said to be rapid at 10° C. or 50° Fahrenheit under water, but in the air the same rapidity is not attained till 25° C. or 77° Fahrenheit.

Albumen coagulates at about 140° Fahrenheit. Some of the disinfecting agents coagulate albumen. Coagulation does not prevent although it delays putrescence.

Dr. Henry (in the *Philos. Mag.*, 1831 and 1832), showed that at a temperature of about 140° Fahrenheit, vaccine matter had entirely lost its peculiar properties. He kept up the temperature for three hours. If heated for three hours at 120° Fahrenheit, it still retains its vaccinating properties. This matter if allowed to stand would then undergo ordinary putrefaction. Dr. Henry also showed that the clothes of fever patients were disinfected by exposure for one hour to a temperature of 200° Fahrenheit.

Mere drying is known to arrest decay, as it is an old but very true saying that unless dissolved (or at least moist) bodies do not act. We are told in "Anderson's Travels in South Africa," that the Damaras are accustomed to cut meat into strips, and dry it in the sun, by which means it is preserved in a climate where decomposition is very rapid. Dr. Henry's experiments show us that even after time was allowed for the infectious matter to absorb moisture from the air, the infectious decomposition did not take place, so that true disinfection had resulted.

The power of cold to arrest the movement of particles chemically as well as mechanically is well ascertained. Animals seem to be capable of being preserved for an indefinite length of time, and even inorganic bodies are preserved from chemical action by cold. Dr. Southwood Smith obtained an organic liquid by passing air through a tube artificially cooled. Guntz put a belljar over putrid matter, and cooled it suddenly, when he obtained drops of a putrid liquid. This illustrates the action of cold in infected air; to some extent it is mechanical by contracting the air and cooling the vapour, so that it can hold no more organic matter in solution. Much heat would to a similar extent act mechanically by expanding the air, so causing less infectious matter to exist in a given space. But this is independent of chemical action.

Air being the initial cause of putrefaction, it would seem strange to class it among disinfectants, but in some respects it is the greatest of all. Its first action is mechanical, as in natural or artificial ventilation. It is known that the worst plagues have arisen in great calms; crowded rooms and unchanged air increase almost every disease, whilst ventilation has a contrary effect. The action of the air on putrid matter is too slow for many of the wants of civilization, and hence the need of an artificial disinfectant. But nature herself has a mode of hastening it by giving an increased power to it under the influence of porous bodies. The porous body most in use is the soil, which is a powerful disinfecting agent, so much so that putrid matter, when completely absorbed by it, unless in excessive quantities, entirely loses its smell, and water drained from soil at a sufficient depth, is found to have lost all its organic matter, so thoroughly has it been disinfected. In doing this oxygen is absorbed, and it will be found that water containing decomposing organic matter has its oxygen removed, serving frequently as a useful index to the state of the decompositions going forward.

I took occasion a few years ago, at the British Association, to show the great value of the soil as a porous material, having the quality with other porous materials of pressing gases into a smaller space than they occupy at the ordinary atmospheric pressure, and thus mechanically compelling combination; and showed that but for this power our towns would lie upon a mass of loathsome corruption, which was now so far from being the case that the water from the soil was much prized, although sometimes too impure for drinking. This is caused by the formation of nitric acid, which is the result of purification, and not only so, but a reservoir of air or oxygen wherewith to purify still more. The water of the Thames contains nitric acid also, and this process is therefore going on constantly in that river, explaining the reason why it is not intolerable.

Dr. Stenhouse has shown this oxidising power to be very great in charcoal, as one of the most porous of bodies, and has fully illustrated its disinfecting properties by shewing that it absorbs impure gases and oxidises them, whilst it has no power of preserving organic substances, and, therefore, is an unfit substance to be mixed with manures. Mr. Condy has applied the same idea of condensed oxygen, rendered still more powerful by being also nascent, to the disinfection of putrid matter, and by a very beautiful scientific idea has produced a very beautiful liquid, completely destructive of putrid matter. It performs the same office as charcoal, but much more rapidly, and there are many cases, especially in private houses, where it will be the most convenient of any to use. Sulphite of soda has been used in France, especially for preserving anatomical subjects; and Mr. Stone, of Manchester, informs me that he used it mixed with kreasote with good effect. Alkaline salts generally are not so much disinfectants as antiseptics; they prevent putrefaction but do not remove the odour from the past putrefaction. Metallic salts have a great disinfecting power, partly from their acid properties allowing them to act like acids, and partly from the fact that some metallic oxides unite with organic matter as well as decompose certain gases accompanying putrefaction. Lead, arsenic, and mercury have been brought forward for the purpose, and the latter especially as corrosive sublimate has remarkable qualities. Berzelius recommends it for injection into the arteries, either for embalming the dead or preserving subjects for dissection. Sulphate of iron has been shewn at many periods to have wonderful properties as a disinfectant, as wonderful as it used to have when it figured in the world as the powder of sympathy. Gay-Lussac, in France, and later Mr. Young, in England, recommended the chloride of manganese, the waste product of the manufacture of chlorine; these all act as disinfectants, but it is exceedingly dangerous to put a very acid liquor to the fœcal matters to be disinfected, as the gases which come off are then worse than before. None of these salts have been so much brought before the world as chloride of zinc, and whether as a preventive of slow oxidation in decay, or of rapid oxidation in combustion, I can testify to its efficiency.

It is above ten years ago, since, in reviewing metallic salts, I was led to believe that none would be ultimately used extensively. They must generally be used as solutions. Now, solutions are unpleasant to use, as it is generally desired to remove the water rather than to increase it. In cow-houses and stables, and on shipboard for example, water and general dampness have to be constantly combated. The solutions themselves are acrid, and hurtful to the person and to clothes, and

the metals have no place in agriculture; disinfection and agriculture must go hand in hand. The continually increasing price of metals shows, too, that they are demanded for other purposes. For these reasons I recommended, in a short paper to the Chemical Society, the use of magnesia or its salts, by which large crystals, containing the ammonia of urine, may be rapidly obtained. Not finding its disinfecting power sufficient, I did not proceed with it far, as I saw that something else was needful to insure complete success. But, some years later, when experimenting with my friend Mr. McDougall, we came to some conclusions which I shall relate.

We agreed that of all bases, magnesia was the best to use for the disinfection of manures, as the only one which gave an insoluble ammoniacal salt and preserved the ammonia at the same time, whilst it was an agent also employed regularly by nature in the economy of vegetation.

That of all acids sulphurous acid was the best, and its power at least equal to chlorine, but it had not the destructive quality which chlorine possesses of decomposing ammonia, whilst when it had done its work, it was either converted into a harmless solid, as sulphur, or, by combining with oxygen and an alkali in the soil, became a sulphate, another agent used by nature. In this manner we used no foreign agent, and adopted the form of ammonia and phosphoric acid, most economical and least ready to be washed away.

We believed that in most cases disinfection would not be employed at all if unpleasant odours were used, and that it would be better to prevent their formation than to allow them to form and then hunt them down with uncomfortable fumes.

We combined the base and the acid, and found that by this means disinfection was nearly completed, by the use of only a small portion of material. My belief is that in many cases this would be sufficient for the purpose, but we were not satisfied. We had tried about the same time that we tried the magnesia in 1847, the carbolic or phenic acid from coal tar, but we had not been able to produce good results by it alone. When the sulphite acted, there was still a small remaining smell which the phenic acid removed; we therefore added to the sulphite about five per cent. of phenic acid, of which the powder slightly smells. We made the compound a powder, as the best of all forms, cheapest, and most convenient for carriage. To obtain abundance of sulphite of magnesia was of course a difficulty, but we found that there were certain advantages in having some caustic lime with it in some cases, so that we used the magnesian limestone; in ordinary cases not saturating it with the acid, but adapting it according to circumstances. Although our first object was to precipitate sewage, we had no good opportunities of doing so, and turned our attention to more attainable objects. After our smaller experiments, we tried it in stables, chiefly at the Manchester Horse-Barracks, when Mr. Gardiner, of the 3rd Light Dragoons, was veterinary surgeon there. That gentleman made many experiments, and decided on its value, finding it beyond his most sanguine expectations. The mode of using it is simply to sweep the stable well and sprinkle the floor with the powder, using as much as would be used of sand in sanding a floor. The bedding is then put over it. It was found particularly valuable when sick or wounded animals were present, as it rendered the odour from the wounds, as well as from the fæces imperceptible. Lieut.-Colonel Unett, of the regiment mentioned, gave the same opinion, and advised its use on board transport ships. Through the kind and zealous interposition of Lieut.-General Sir Harry Smith, who had experienced its benefit in his own establishment, the circumstances were represented to the Secretary of War, who ordered that every transport ship conveying troop horses to the Crimea should be furnished with it. This was done in the latter part of the war with the utmost success, so much so that many requests were made for it from other transports. Its use was begun with great success in the camp, as we find from Mr. Doyne, Engineer in Chief, Army Works Corps. We could never get it introduced generally into the camp, although experience has shown that it would have remedied one of the greatest discomforts with absolute certainty. In consequence of powdering the floor with it almost daily, the manure becomes thoroughly mixed with the disinfectant. The results are remarkable. The manure does not heat or ferment, as in other cases, so that there is no fear of loss by ammoniacal gas, or by putrid vapours. The liquid which flows from it is without smell. From the arrest of decay, flies do not come around it in numbers, and the horses also are preserved from flies, a state which has a very favourable effect upon them. Mr. Murray, who has always four or five dozen of the most valuable horses on hand, says that headache has disappeared from his stables; and of lung disease, which was formerly common, he has not had an instance. The horses are healthier and in better spirits, whilst a good deal of straw is saved. They breathe air without either ammonia, which hurts the eyes of those who enter, or of putrid matter; the whiteness of the powder makes the stable appear as if constantly newly whitewashed. A curious circumstance is said by most of those who use it to occur. The stable is cooler, not only to the feeling, as we might suppose, by removing animal matter, but to the thermometer. I have not made the observations myself, but they are to be relied on, and to the feeling the change is distinct. The removal of heat I ascribe to the fact that the animal matter has ceased to oxidise. The slow combustion or putrefaction produces heat in the manure, probably also in the atmosphere itself, where the vapours are mixed with the oxygen. The oxidation and putrefaction are simultaneously arrested. It might be said that since decomposition is arrested, the manure is made unfit for plants; besides, it is known that liquids from tar put a stop to vegetable life as they do to animal. But Mr. Murray found that after having sold his manure of one year with the powder in it, he was offered double for it next year. It is therefore established that a just medium has been attained, the preservation of the manure on one side, and the health of the plant on the other.

Perhaps the best authorities as regards horses are the veterinary surgeons of Manchester, who use it and find it essential, for "sweetening the air and destroying all offensive emanations from breath, dung, or wounds."

I have heard instances, too numerous to allude to, of long standing complaints of waterclosets and cesspools being cured by a single application, sometimes not needing renewal for months, but I cannot go over the same ground twice, nor, although I read on this subject by request, do I wish to use the style of those who speak more from interest than conviction. I know that no amount of assertion will make you believe these facts till they are tried before your eyes, and for that reason have never till now spoken publicly on the subject; but when requested, I thought it might be a greater fault to shrink from such a public method of speaking my opinions, than it would be to appear to use such an occasion for merely selfish purposes. It is especially important, now that a lung disease amongst cattle threatens us, that these experiences of ours should be made known, as it appears that, quite unknown to ourselves, we have been experimenting chiefly in that direction which is most at present required, and with greater success than we had ever anticipated.

As I am not in business, and did not wish to be, the powder was called "McDougall's Disinfecting Powder." As I have shown, it is chiefly by a combination of results and plans that novelty has been produced, a novelty chiefly practical, but bearing also on science.

Our chief intention originally was to use this powder

for sewage; of its value in other respects we had only a faint idea. I shall not even begin the consi-consideration of its economical value, as it will be brought forward on another occasion, but there are some points of importance which I wish to bring forward. In precipitating sewage with whatever material, great tanks have been erected outside of towns, and these are a terror to every neighbourhood. But before arriving at these tanks the sewage has passed through the town, has given off what vapour it could, and done all the mischief it was capable of doing; as soon as the mischief is accomplished it is proposed to disinfect the material.

The great object desired is to purify towns. We propose to disinfect the whole sewage of a town in the town itself, and to pass the disinfectant into the sewage at various points, so that all the main arteries may be rendered pure. Air rushing from them into private sewers will convey the impurities of the private sewers only, which each may disinfect for himself. If disinfection of private sewers should become common, the public use might then be given up. By this means we purify whole cities. The sewage water will come from the town in a disinfected state, and it may be carried to any point without any fear of creating a nuisance. If carried through an agricultural district, it may be used as liquid manure, either by drains or by the jet, without any fear of an action for damages. Without disinfection the sewage will certainly not be an agreeable neighbour; with disinfection the channel will be a more wholesome institution than our present canals. A channel like this need not be covered. To make a covered channel is naturally a most serious undertaking, and even to use the liquid manure from a covered channel will be dangerous. Sewers will then, for the first time, be unqualified blessings. At present they are dangerous at the best, and we dread every connection with them.

The state in which the disinfectant will be applied in the sewers, must differ to some extent according to the condition of the water or sewage, the principle of its composition not changing.

This, as a comprehensive plan for disinfecting towns, and rendering the use of sewage manure agreeable, is, I conceive, of great importance, nor am I aware of any such comprehensive plan ever having been brought before the public, at least not before it was proposed by Mr. McDougall and myself.

We have never had an opportunity of trying this system in the method proposed, but we had the opportunity of disinfecting a whole town. The town of Leek was attacked by an epidemic last year, and a council of medical men called on Mr. McDougall for his advice. He, amongst other things, proposed, on consulting with me, the plan above stated, and, as a temporary measure, not so much promising great good as to allay the fears of the inhabitants, he proposed disinfecting some of the principal cess-pools with the disinfecting powder. In reply to my inquiries, Mr. Dale, C.E., the town surveyor, says, "Its use was most efficient in staying the plague; never was the intimate connection between foul cesspools, &c., and disease more strikingly demonstrated. The fever and putrid sore throats prevailed most in the neighbourhoods nearest to the open sewers and cesspools. On using the disinfecting powder, the offensive smells were perfectly removed, and the abatement of the disease immediately followed. There were *no new* cases, and those under treatment at the time assumed a much milder form. We exhausted a small stock of disinfecting powder on the 3rd of January. In the course of a few weeks, when the cesspools began again to give off offensive smells, the disease broke out a second time, when the authorities ordered a further supply, and upon using it as before, the disease again assumed a milder form and eventually disappeared."

This is an extreme case, but the purification of towns by means of their sewers I hold to be valuable in all cases, and their corruption should be instantly arrested. It matters nothing to us to be told that the corruption will be arrested next morning at the distance of six miles, when a stream runs by us of the same kind without interruption. The inhabitants of London must either endure the evil, and then send it to their country friends, or they must purify the sewers themselves, the source of the evil, for the benefit of both.

I now trust that the ideas I have brought forward will be found somewhat interesting and useful to the community, as well as to the audience which has honoured me by their attention.

DISCUSSION.

The Chairman was sure the Society had been pleased with the learned paper that had been brought before them that evening. It had been his pleasure to know Dr. Smith for many years as an accomplished scholar, as well as an excellent chemist. The interesting information he had given with regard to the knowledge of this subject possessed by the ancients had been highly instructive, but there was one person to whom he could have wished Dr. Smith had referred, because he was equally well versed in the sacred as in the profane writings. The greatest hygeist of ancient as well, perhaps as of modern times, was Moses, who gave hygienic laws to the Israelites which might have been used with advantage by the English on a late occasion, both in camp and field. The instructions which he gave for the regulations of the encampments of the Children of Israel during their Exodus, proved that he had a great knowledge of hygienic laws; but though the ancients appeared to possess this extensive knowledge of disinfectants, it was a question whether their sanitary state, and their freedom from substances which required the use of disinfectants was so great as was the case in the present day. They knew that perfumes were more valued and used in those times than now, and perfumes when used to a large extent were often an index of the want of cleanliness; though, when used to a moderate extent, like flowers, they were grateful and agreeable. Perfumes as well as deodorisers were employed, not to disinfect, but to mask something that required to be corrected. Deodorisers were not necessarily disinfectants, and must in their application be distinguished from them. Disinfectants were of two classes, one class being *preventives*, and the other *destroyers*. Kreasote was an instance in the first class, chlorine in the second. The powder which had been described by Dr. Smith possessed very singular qualities. One of its ingredients was the substance known amongst chemists as carbolic acid, a most valuable and interesting substance. It was closely allied to kreasote, and was, in fact, a homologue of kreasote. It had the power of uniting with bases, and forming salts, and thus it could be more readily applied than kreasote. It prevented putrefaction; and when mixed with the sulphite of magnesia had its disinfecting properties increased. There was one point with regard to magnesia which was important in a chemical view. Magnesia rendered ammonia solid, and on that account was valuable. It not only took down the phosphoric and other salts contained in liquid manure, but carried down the ammonia also, thus preserving the most valuable and important constituent of the manure. Therefore the use of magnesian salts, with carbolic acid as a preventive, was a happy idea. He saw present many medical men as well as distinguished chemists, who he knew had given considerable attention to this subject, and he would be glad to hear their remarks upon it.

Mr. Dugald Campbell observed that he wished he could coincide with the view the chairman had taken of the action of magnesian salts upon sewage water, namely, that they would precipitate phosphoric acid and the ammonia from it; but really practically this was not the case, for it unfortunately happened that the phosphate of

magnesia and ammonia was soluable to a certain extent in water, and in every case the water in the sewage of towns was far more than necessary for this purpose. In a paper which he (Mr. Campbell) had been requested to give recently, before the Chemical Society, he had shown, and he thought without any exaggeration, that the total solid matter in the sewage of London was in the proportion of one to between four and five thousand of water. He had examined every process hitherto proposed for obtaining the solid matter from sewage, and he regretted to say that there was none by which one-tenth of the value in the sewage could be secured, for the ammonia or the substances representing it, namely, the urea or uric acid, and the potash and phosphoric acid, the true valuable matters for manure in the sewage water almost entirely passed away in the water after any process as yet suggested. Of course for stables, cesspools, and such like places, where the fœcal matter was in an undiluted state, the powder mentioned by Dr. Smith, as well as many other things, would, no doubt, do very well and suppress their odour, at the same time preventing the evaporation of their ammonia. He would have been glad if Dr. Smith at the same time that he had proposed to disinfect the sewage before it reached the main sewers of the town, had shown how this was to be effected.

Mr. P. H. Holland (Medical Inspector, Burial Department of the Home Office), remarked that the hint thrown out by the Chairman ought not to be lost sight of, viz., that deodorizers were not disinfectants, and great care must be taken that they were not used as maskers of danger. Dr. Smith had not recommended the use of either as a substitute for the removal of the cause of danger and offence, and people must be cautious that they were not so applied. During the last two or three years, his attention had been called to the disinfecting powder described by Dr. Smith. He had been directed by the Secretary of State to inquire into its properties in connection with the burial of the dead. It was, in the first instance, suggested that this powder, or some similar substance, might be used as a means of getting rid of proper interments of human bodies; that they might heap bodies one upon the other, and employ this powder to prevent annoyance. But there was one thing in connection with burials in which such a powder as this would be valuable. It sometimes must happen, and often did happen, that for various reasons dead bodies were kept uninterred until they became offensive, and he had found, both by experiment and enquiry, that this powder was effective in preventing annoyance in such cases. It would be in their recollection that about two months ago, a terrible colliery explosion took place, by which a great number of lives were lost. The bodies of about 190 men and boys and of some horses, were for the most part still in the mine, and he was instructed to advise how the burial of these bodies could be managed with the least possible amount of annoyance and danger to the community. Previous experiments led him to believe that this powder was the best means of effecting that end, but at the same time he was not satisfied that it would alone prove sufficient. There was in the case he alluded to, a coal mine with an accumulation of some 8,000,000 or 10,000,000 gallons of water, in which about 200 bodies had been soaking for two months in various stages of decomposition, and therefore very offensive. These 200 bodies had to be got out of the mine and carried some two miles to the place of interment, and that, it would be admitted, was a difficult matter to accomplish without danger and annoyance. The first step was to get the water out of the mine, which, it was considered, from the great quantity in proportion to the organic matter, could not be very offensive. This water it was proposed to render less dangerous by adding lime in excess, and in the event of that not proving successful, it was proposed to add a quantity of this disinfecting powder, and, with a view to clear the mine of the noxious gases evolved, it was suggested that sulphurous acid gas would be most likely to be effectual for the purpose. It was, therefore, decided to burn sulphur in the mine. As a further precaution, instructions were given that the men who went down the pit for the purpose of exploration should proceed in the direction of the current of air and not against it; that they should enter by the down-cast shaft, whilst the putrid vapours were blown away before them. The plan adopted was to take down sheets liberally sprinkled with the disinfecting powder in which the bodies were enveloped as soon as discovered, and placed in shells lined with pitch which were embedded in sand, entombed in brick cells, closed up air-tight and covered with six feet of soil. These measures were being carried out as quickly as the bodies were recovered, and he was happy to say, notwithstanding a rumour to the contrary, not a single case of serious inconvenience or danger had yet occurred. The speaker then proceeded to state, that at the time when the whole of England was moved with grief at the harrowing details of the disasters in the hospitals at Scutari during the late war, it occurred to him to place at the disposal of the War Department a large donation of this disinfecting powder. The offer was accepted; the powder was sent, but he never heard of its ever having been used; he was quite ignorant what became of it, and, for anything that he knew about it, it might have gone to disinfect the Black Sea. With reference to the case of the epidemic in the town of Leek, alluded to by Dr. Smith, he (Mr. Holland) was in the first instance somewhat uneasy lest the outbreak of disease in that locality should have been, in some degree, occasioned by his own neglect. He had been told that it arose in consequence of the disturbance of the churchyard there, which he ought officially to have got prevented. But he was happy to find he had been misinformed, for the medical men of the place assured him that the epidemic and the state of the churchyard had no connection with each other. He felt bound to say that the information he had received with regard to the effects of the use of the disinfecting powder in the case mentioned fully agreed with the statement they had heard from Dr. Smith that evening, viz., that it had been highly successful in arresting the epidemic. It did not prevent persons being attacked by the disease, but it prevented, in a great measure, its malignity. This was a case in which it was impossible to effect the immediate removal of the organic matter to the accumulation of which the epidemic was attributed, because the sudden disturbance of a large mass of filth during an epidemic would have been most dangerous, and under such circumstances disinfection was the only available remedy.

Mr. Robert Rawlinson said he would rather hear the paper discussed on its merits by chemists, than occupy the attention of the meeting with remarks only connected in a secondary degree with the subject; but, as no other person rose, he would give his ideas of disinfectants and their legitimate use. The application of disinfectants to town sewage he would avoid, as that investigation was in the hands of a Royal Commission, of which he was a member; there were, however, purposes for which disinfectants in some form must be of the greatest practical benefit, and here Dr. Smith's disinfecting powder had been proved to be of extreme value. There were certain places which no amount of labour, mechanically applied, could cleanse, and the aid of the chemist was therefore absolutely necessary. Stables, horse-transport ships, shippons, especially milk-cattle sheds in or near large towns, cattle-ships, steamers, &c., emigrant-ships, and merchant-ships generally with bilge-water; ships of war, temporary hospitals, barracks, and wherever there were crowds of human beings and cattle; in such cities as Paris, where there were foul cesspools, and in many other places. So urgent was the necessity for the use of some form of disinfectant on board emigrant ships, cattle-ships, steamers, and merchant vessels generally, that he (Mr. Rawlinson) considered the legislature ought to make it imperative that the

owners and managers should provide and use the best disinfectants; it was imperative that emigrant ships should have on board a surgeon or surgeons; the disinfectants in many cases, if used properly and promptly, might be of more value than the surgeon; at all events, the surgeon would have at command a material more powerful for good than many in his medicine chest. For fixed populations, he (Mr. Rawlinson) considered that sewers and drains should be so built and so ventilated as to prevent mischief without disinfectants within the town-sewers, and, most certainly, all hospitals, public buildings, and barracks should not require their constant use. The arrangements in barracks were at present most abominable, and disinfectants might be required, because soldiers were compelled to use one and the same room for night and day; and the barrack committee, even, in spite of the strongest evidence given them of the foul state of these rooms at night, had deliberately recommended a continuance of the system. Barracks as they were, and as they were to be, if the recent recommendations were adhered to, would require a use of disinfectants, but it was to be hoped that the barbarism of confining men to one room day and night, would be abolished. Having paid some attention to sanitary regulations, he would remark, in conclusion, that disinfectants for human habitations should only be relied on temporarily, and until more perfect structural arrangements could be carried out; for animals, that is, in stables, &c., it was probable disinfectants must ever be relied on, as no amount of draining, paving, or cleansing would render such places sweet and wholesome. Town-sewers and house-drains must be abundantly ventilated outside of the houses, and not at the surface of the streets, where, by diffusion of the gases, the greatest mischief might be worked, but, at elevations not lower than the ridge of the houses. Sewage, at its outlet or outlets, must be disinfected, or be applied direct to the land. How this was to be done in the best and cheapest way was the question. Dr. Smith's powder might or might not be the best material, but the Doctor was too honest to claim more than was due, or to recommend that which he did not know and believe to be valuable. No stable or shippon ought to be used without this powder, if it were the best and cheapest.

Dr. Albert J. Bernays said he had tried the disinfecting powder alluded to with signal success. His first experiment with it was in removing an offensive odour caused by a drain at his own residence. He had applied a thick coating of the powder, which still remained, and since its application no unpleasantness whatever had been experienced. He mentioned cases of the application of this powder during the process of emptying large cesspools, by which the contents of those receptacles were completely deodorised and the noxious gases driven off, so that the operation was performed without inconvenience to those employed in it. He had also used the powder in the wards of the hospital with which he was connected, with the most satisfactory results as a deodoriser.

Dr. Milroy remarked that the terms disinfectants and disinfection, to medical men involved two distinct ideas. Disinfectants had reference to the supposed prevention of infection being communicated from a sick person to a person in health. Some diseases being infectious, it had been supposed that by the use of certain agents the infectious properties might be destroyed, and the disease prevented from spreading, and he supposed it was in that sense that the parliamentry grant was given to Dr. Carmichael Smyth in reference to the use of acid gas for the arresting of typhus and other fevers in gaols and public establishments. Experience did not, however, warrant them in saying that the spread of infectious diseases was prevented by that means. When gases of that description were used they were associated with free ventilation; and the experience of late years had shown that the simple use of free ventilation in buildings or on board ship had in itself all the power that the use of these various agents professed to effect. He believed it was a most mistaken notion to suppose that the required benefits would be experienced from the use of chlorides or other such disinfecting agents unless free ventilation were carried on at the same time. It would be most hurtful that it should go forth to the public that the use of these agents alone would prevent the spread of contagious fevers, &c., in buildings or in vessels. The great agent of disinfection was unquestionably the continuous change of the air; and whether or not they used these agents in addition (for he did not mean to say they were not most useful auxiliaries), it would be a most dangerous thing to suppose that their use could compensate for the want of free ventilation. Mr. Rawlinson had referred to the subject of ships, which probably afforded the best opportunities for making experiments in relation to disinfection in the double point of view to which he had alluded, viz., the preventing the spread of disease, and the drawing off of vitiated atmosphere by means of thorough ventilation. In the event of disease breaking out on board ship, the simplest and best plan, in his opinion, was to disperse the patients over every part of the ship, and as far as possible place them under canvass on deck. He thought the great error generally committed in reference to infectious diseases on board ship, was continuing to treat the patients between decks, which, even in the best appointed ships was a matter of great difficulty, and therefore, wherever it could be done, the proper plan was to encourage ventilation in the ship, and, where it was possible, to bring the sick men on deck, and put them under tents. He thought one great cause of the spread of contagious diseases in a ship, arose from the fact of the men being too much crowded together. In ships of war carrying from 900 to 1000 men, the whole crew were berthed in half the space that was necessary and available. There were three decks, and instead of the men being scattered over these spaces the whole were accommodated on a deck and a half, leaving the same amount of room unoccupied. They could never hope to meet such a case as that by the use of disinfectants. The use of chlorides might correct noxious effluvia, but the only real remedy was the removal of the cause. It was a dangerous thing to trust to disinfectants where the cause of the infection was removable, and in 999 cases out of 1000 he believed the causes were removable. The chairman had alluded to the importance of some of the hygienic rules laid down by Moses for the maintenance of health in the encampments of the Israelites during their journeyings. They found that in the Mosaic institutions a primary place was given to the destruction by fire of every abomination that could be so destroyed. The remains of the sacrifices were taken without the camp and consumed by fire. The streets of Jerusalem were not only swept daily, but the material so collected was burned outside the city. He thought these matters were not sufficiently attended to in the present day. He had personally witnessed the destruction of offensive matter in the camp before Sebastopol, either by burying or burning. In the cavalry camp the litter of the horses was burned; but in the first instance it was imperfectly done. With a proper system, the accumulation of large heaps of offensive matter might have been prevented by burning, to the benefit of the sanitary condition of the army. He thought there was no question but that fire might be more beneficially employed in destroying what was offensive and injurious to health, and the refuse of the combustion containing charcoal and saline matters might be employed with good effect in sprinkling surfaces that had been polluted by the impregnation of organic impurities.

The Chairman here called attention to a specimen of disinfecting fluid before him, which he said contained a clever application of oxygen gas. This substance, which

was called "Condy's Patent Natural Disinfectant,"* contained for 2 equivalents of manganese, 7 equivalents of oxygen, and these, in a state of combination, readily attacked organic impurities and destroyed them.

Dr. R. Angus Smith, in reply, said, in answer to Mr. Campbell, that he had not anticipated the removal of all the ammonia from the sewage of London by precipitation, but it would be preserved in the liquid, because decomposition would be arrested. The sewers, therefore, would give off no foul air, and lose none of their value for manure. If not disinfected the manure would be of little value at a few miles distance. A portion only of the ammonia would be precipitated. At present the liquid manure was constantly undergoing decomposition. By arresting that process it would be preserved. In the case of manure from stables, cow-houses, cesspools, and similar places, all the ammonia, phosphates, and organic matter would be completely preserved. In answer to the other speakers Dr. Smith said that he had no desire to supersede air, which was a better invention than any one which had passed through the Patent-office. Ventilation removed impurities, but in their passage they came in contact with persons and with objects. Now if the decomposition were arrested before removal, they would pass off without doing mischief. He (Dr. Smith) wished to arrest the putrefaction in the sewers, and to let the sewage pass through London without giving off offensive fumes. This plan both rendered ventilation of sewers unnecessary, and prevented loss of material. A similar result followed the use of air. Disinfection rendered the vapours that arose in hospitals, &c., innocuous, and ventilation might then be used with less violent currents of air, which, after all, did not destroy the evil, but only diluted it. Dr. Smith added that the disinfecting powder was gradually getting introduced amongst emigrant ships, where liquids were so objected to.

A vote of thanks was passed to Dr. Angus Smith.

The Secretary announced that on Wednesday next, the 29th instant, a Paper by Mr. Francis Bennoch, "On Metropolitan Improvements and Thames Embankment," would be read.

PARCHMENT PAPER.

At the Royal Institution, on the 3rd inst., the Rev. J. Barlow gave a lecture on this subject. Mr. W. E. Gaine has discovered the remarkable fact, that by a momentary immersion of paper in strong sulphuric acid, diluted with half its bulk of water, and allowed to cool, and then instantly washing it free from acid, first in plenty of water, and then in weak ammonia, it becomes endued with such extraordinary tenacity, that whereas a band of the original paper, of about an inch in width, breaks under a weight of seven or eight pounds, in its modified condition it will support nearly a hundredweight. The lecturer stated that Messrs. De La Rue and Co. had entered into an arrangement with the discoverer to introduce it into commerce, where, from its almost indestructibility, it will doubtless supersede parchment in many of its applications. Specimens of engravings were exhibited which had been so treated *after* having received the impression: the acid had in no way injured the lines of the engraving, whilst the great contraction which the paper underwent, gave a delicate softness and sharpness to the picture. Several photographs were likewise exhibited which had been printed on this parchment-paper, as it is called, the peculiar hard nature of the surface enabling photographers, the inventor states, to obtain beautifully rich tones with a far less expenditure of nitrate of silver than at present.

Mr. William Crookes, in a communication to the *Journal of the Photographic Society*, says:—

"On seeing the really wonderful change which had by this simple means been wrought in an engraving, the thought instantly occurred to me, what would be the effect of treating a finished photograph in this manner? We know of many instances in which a strong acid exerts apparently less energetic action on bodies than the same acid diluted; and it was just possible that the metallic compound, whatever it may be, constituting the dark part of a positive paper photograph, might pass unscathed through the ordeal; the idea was at all events well worth putting to the test of experiment, and, accordingly, the same night, strips, of photographs, selected as samples of different tones of printing, and various kinds of paper, were passed through the acid according to the plan above stated.

"The result was one which I certainly had not anticipated: the colour and tint of the picture, even in the most delicate half-tones, remained perfectly intact, while the powerful, yet uniform contraction of the paper added considerably to the sharpness; the paper was, besides, suddenly gifted with such great strength, that not only would it bear the roughest handling during the washing operation, without even the possibility of tearing it; but at any after-time, when finished and mounted, it would bear hard rubbing with soap and water and a wet cloth, without the slightest roughening or abrasion of the suface, if it were sufficiently dirty to render such a mode of treatment advantageous. Added to this, the surface (of an unalbumenised print) assumed a peculiar glossy appearance, giving a richer finish to the picture, without the glare which is so much objected to in albuminized pictures. Another effect, which time alone can decide whether or no it may be added to this long list of advantages, was this: a picture which was fading rapidly, was so treated on one half only; there was a powerful odour of hydro-sulphuric acid evolved, and certainly there has been no further fading since, although the short space of time which has elapsed since trying the experiment, makes it difficult, as yet, to appreciate any difference between the two halves as regards their intensity."

Home Correspondence.

DISINFECTANTS.

Sir,—During the discussion on disinfectants last evening allusion was made to chloride of zinc. Specimens were placed on the table, but it does not appear to be generally known that in the list of medical stores directed by the Board of Trade to be kept on board British merchant-ships on foreign voyages, pursuant to 17 & 18 Vic., cap, 104, sec. 224, chloride of zinc is the only disinfectant ordered to be used.—I am, &c.,

GEO. F. MORRELL.

April 23rd, 1857.

FŒCAL DISINFECTION BY FIRE.

Sir,—The paper of Dr. Smith makes out very clearly the distinction between deodorising and disinfecting, and the discussion made it as clear that disinfecting, though it may be a concomitant with, ought by no means to be considered a substitute for, thorough ventilation.

But the necessity for disinfection arises from putrefactive fermentation. For example, fresh fœcal matter is merely putrid; the constant rapid passage of fresh air, *i.e.*, thorough ventilation, would prevent putrefaction, and so also would the total absence of air.

The addition of water would at first diminish the perception of odour, and subsequently it would hasten putrefaction when thoroughly saturated.

Can we dispense with water and prevent putrefaction? I will suggest an experiment.

Take a vessel of glazed stone ware, say two feet in diameter and three feet in depth, fitting it with a cover, as a closet.

* Dr. Hofman, in reference to this liquid, says, "I have carefully examined the alkaline manganates and permanganates with reference to their application for the purposes of deodorizing and disinfecting, for which you propose them. The remarkable facility with which these substances give off their oxygen to other bodies being taken into consideration, the idea of using these salts as deodorizers and disinfectants appeared to me *a priori* a most happy conception; but I was scarcely prepared for the extraordinary effects which the manganates and permanganates are capable of producing when employed for this purpose."—Ed. *S. of A. Journal.*

Place in it a given quantity of Mr. M'Dougall's disinfecting powder, and three to four inches in depth of the shale oil made in Glasgow by Mr. Young, or the earth oil of Rangoon.

Use the vessel so prepared for the reception of fœcal matter without urine or water till it be half full, taking care that the oil be in such quantity as always to float over the surface and thus hermetically seal the fœcal matter from access of the air.

When sufficiently full take the vessel to some gasworks and place the contents in a retort, unconnected with the main gasometer, but discharging the distilled gas into a special vessel.

The gas and its illuminating qualities may then be ascertained, and also the residual ash or coke.

If it should turn out that the oil and Mr. M'Dougall's powder will prevent all evolution of gas, and that the destructive distillation is effectual and useful, we shall obtain a new and very important starting point which may indicate the means of obtaining a pure river without costly sewers.

I believe that by fire, and not by water, is the purification of our cities to be accomplished. Fire is a destroyer of miasma—water is but an extender. The dried fœces of animals are the sole fuel in many districts of the world, and are absolutely inodorous. It is possible that, from one step to another, in our city improvements we shall gradually displace our water-closets and substitute for them oil-closets and fire retorts, heated by gas jets, which will purge and burn away our grosser excreta. I have more than once propounded this doctrine in print.—I am, yours faithfully,

W. BRIDGES ADAMS.

April 22nd, 1857.

THE TIDES IN THE SOUTH PACIFIC.

Sir,—A short time ago, in scanning the pages of an old book of Travels in the South Seas (by the Rev. J. Williams, a missionary,) my eye fell on some brief remarks on the phenomena of the tides of some of the islands, which seems to me to be so singular that I take the liberty of transcribing the passage. He says:—"It is to the missionaries a well-known fact, that the tides in Tahiti and the Society Islands are uniform throughout the year, both as to the time of the ebb and flow, and the heights of the rise and fall, it being high water invariably at noon and midnight, and consequently the water is at its lowest point at six o'clock in the morning and evening. The rise is seldom more than eighteen inches or two feet above low-water mark. It must be observed that mostly once, and frequently twice in the year, a very heavy sea rolls over the reef, and bursts with great violence upon the shore. But the most remarkable feature in the periodically high sea is that it invariably comes from the west or south-west, which is the opposite direction to that from which the tide wind blows. The eastern sides of the island are, I believe, never injured by these periodical inundations. I have been thus particular in my observations, for the purpose of calling the attention of scientific men to this remarkable phenomenon, as I believe it is restricted to the Tahitian and Society Island groups in the South Pacific, and the Sandwich Islands in the North. I cannot, however, speak positively respecting the tides at the islands eastward of Tahiti, but at all the islands I have visited in the same parallel of longitude southward, and in those to the westward, in the same parallel of latitude, the same regularity is *not* observed, but the tides vary with the moon, both as to the turn, and the height of the rise and fall, which is the case at Rarotonga." Admiral Beechey is the only person, that I am aware of, who has given any solution to the question, and he proposes as a simile a basin to represent the harbour, over the margin of which the sea breaks with considerable violence, thereby throwing in a larger body of water than the narrow channels can carry off in the same time, and consequently the tide rises, and as the wind abates the water subsides.

This Mr. Williams denies, and in proof of his assertion brings forward several arguments and states several facts, of which I select the following as most likely to bear on the point:—

1. That the undeviating regularity of the tides, is so well understood by the natives, who distinguish the hours of the day by terms descriptive of its state, such as the following, "where is the tide," instead of "what o'clock is it."

2. There are many days during the year when it is perfectly calm, and yet the tide rises and falls in the same way, and very frequently there are higher tides in calms than during the prevalence of the trade winds.

3. The tides are equally regular on the west side of the island, which the trade wind does not reach, as on the east, from which point it blows.

4. The trade wind is most powerful from noon till four or five o'clock, during which time the water ebbs so fast, that it reaches its lowest level by 6 o'clock, instead of in the morning, as Admiral Beechey states, at which time it is again high water.

Admiral Beechey's explanation being manifestly at variance with the truth, it devolves on abler heads than mine to give a satisfactory solution; and hoping you will excuse my troubling your columns with the above interesting facts, I am, &c.,

"INQUIRER."

April 20, 1857.

MEETINGS FOR THE ENSUING WEEK.

Mon. Philosophical Club, 5½. Anniversary.
Actuaries, 7.
London Inst., 7. Mr. T. A. Malone, "On Photography; its present condition and most important applications."
Geographical, 8½. I. Sir John F. Davis, "On China and the Chinese." II. Commander A. C. Gregory, "Completion of the North Australian Expedition."

Tues. Royal Inst., 3. Dr. J. P. Lacaita, LL.D., "On Italian Literature—Dante."
Civil Engineers, 8. Discussion: "On Electro-Magnetism as a Motive Power," and if time permits, Mr. G. L. Molesworth, "On the Conversion of Wood by Machinery."
Med. and Chirurg., 8½.
Zoological, 9.

Wed. Zoological, 1. Anniversary.
Society of Arts, 8. Mr. F. Bennoch, "On Metropolitan Improvements and Thames Embankment."

Thurs. Royal Inst., 3. Prof. J. Tyndall, "On Sound, and some associated phenomena."
Royal Society Club, 6.
London Inst., 7. Mr. T. W. Burr, "On the History and Instruments of the Royal Observatory at Greenwich; and of other celebrated Observatories and Instruments, with the principal discoveries made by their means."
Antiquaries, 8.
Royal, 8½.

Fri. Horticultural, 1. Anniversary.
Archæological Inst., 4.
Royal Inst., 8½. Capt. John Grant, "On the Application of Heat to Domestic Purposes, and to Military Cookery."

Sat. London Inst., 3. Prof. Robert Bentley, "On Systematic Botany, with especial reference to the natural systems of arrangement."
Royal Inst., 3. Prof. E. Frankland, "On the Relations of Chemistry to Graphic and Plastic Art."
Medical, 8.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, April 17th*, 1857.]

Dated 12th December, 1856.

2954. Henry Wimball, Aldermaston, Berks—Improvements in machinery or apparatus for the manufacture of bricks, tiles, pipes, and other articles of a similar nature.

Dated 31st January, 1857.

288. Duncan Morrison, Bordesley Works, Birmingham—A new or improved manufacture of ordnance.

Dated 27th February, 1857.

578. Edward Mucklow, Bury—An improvement in the manufacture of "alizarine."

Dated 3rd March, 1857.

618. James Broad, 149 and 150, Drury-lane—The application of artificial boards, or papier maché, or patent composition boards, composed (or partly so) of any vegetable fibre, and the like, either in its raw state or worked up from old substances, to friction washers of every description of wheeled carriage and cart axles, also for covering wing and dash irons, and forming heel boards for Hansom cabs.

Dated 7th March, 1857.

664. Eléonore Augustin Pagnerre, 143, Drury-lane—A machine for counting, cutting, and inserting wire in blocks of wood for the purpose of printing and stamping on linen, calico, silk, cloth, and paper, and for all printing purposes.

Dated 18th March, 1857.

746. George Farrell Remfry, Riches-court, Lime-street—A portable apparatus for working punkas and whisks.
748. Thomas Dean, Whittle-lane, near Burnley—Improvements in looms.
750. William Edward Newton, 66, Chancery-lane—Certain improvements in artificial legs. (A communication.)
752. James Withnall, Manchester—Certain improvements in the manufacture of rollers or cylinders to be employed for printing calico and other surfaces.
754. William McCulloch and Thomas Kennedy, Kilmarnock, N.B.—Improvements in stop-cocks or valves.
756. John Fox, Preston—An improved music scale.

Dated 18th March, 1857.

758. Thomas Yarrow, Arbroath, Forfar, N.B.—Improvements in locomotive steam engines.
760. François Barthelemy Loubatières, Agen, France—Improvements in the manufacture of paper, cardboard, and pasteboard.
762. Richard Talbot, Moxley, near Bilston, Staffordshire—Improvements in furnaces and in the manufacture of iron.
764. Lewis Hope, Bishopsgate Churchyard—Improvements in the manufacture of paper. (A communication.)
766. John Horace Taylor, New York—Improvements in buckets and valve seats for bilge and other pumps.
768. Joseph Lewis, Salford—Improvements in machinery or apparatus for reaping and mowing.

Dated 19th March, 1857.

770. Henry Armistead, Colne, Lancashire—An improved "picker," to be used in power looms for weaving.
772. Richard Archibald Brooman, 166, Fleet-street—An improved projectile. (A communication.)
774. Marie Amedie Charles Mellier, Frews Weir Mills, Exeter—Improvements in desiccating or drying paper and other goods in process of manufacture.

Dated 20th March, 1857.

776. Thomas Sidebottom Adshead and Abraham Holden, North-end Mills, Stalybridge, Cheshire—Certain improvements in machinery for carding cotton and other fibrous materials.
782. Charles Weiss and Henry Lister, Huddersfield, and John Mitchell, Sheepridge, near Huddersfield—Improvements in finishing woollen and other textile fabrics, and in the machinery or apparatus employed for that purpose.
784. Nathan James Greenwood, Morley, near Leeds—Improvements in spinning mules and slubbing machines.
786. John Chedgey, the Grove, Southwark—Improvements in machinery for mangling, calendering, or pressing goods.
788. Isaac Atkin and Marmaduke Miller, Nottingham—Improvements in dividing lace.

Dated 31st March, 1857.

885. John Campbell Evans, South Lambeth—Improvements in railway rolling stock.
887. Samuel Jabez Goode, Aston, near Birmingham—Aimprovement or improvements in depositing metallic alloys by electricity.
889. George Lauder and Thomas Ireland, Dunfermline, N.B.—Improvements in the manufacture of brine to be used in the manufacture of salt.
891. John Graham, Ann-street, Devonport-street, Commercial-road, East—An improved steering apparatus.
893. Anguish Honour Augustus Durant, Conservative Club, St. James's—Certain improvements in omnibuses.

Dated 1st April, 1857.

895. Charles Iles, Birmingham—Improvements in bolts for doors.
897. Benjamin Horatio Paul, Torrington-street—Improvements in the preservation of stone, either natural or artificial, also of cements and other similar compositions.
899. Charles Greeves, St. Thomas-street, Southwark—Improvements in breech-loading guns and pistols.
901. Robert Adam, Paisley—Improvements in preparing and finishing threads or yarns.
903. Lambert Perin, 2, Rue Barbette, Paris—The easy discovery of flaws and escapes in gas pipes.
905. John Sugden, Bradford—Improvements in the manufacture of combs for combing wool, silk, cotton, flax, or other fibrous materials.
907. Alfred Vincent Newton, 66, Chancery-lane—Certain improvements in fire-arms. (A communication.)
909. John Oliver, 28, Bow-lane, Poplar—Improvements in apparatus for manufacturing and conveying sulphuric acid.

Dated 2nd April, 1857.

911. George Lowry, Salford—Certain improvements in machinery for heckling flax and other fibrous materials.
913. John Frederick Wieland, Glasgow—Improvements in portable apparatus and materials for cleaning the teeth.
915. Howard Ashton Holden, Bingley Works, Birmingham—Certain improvements in carriage lamps and general carriage and harness furniture and fittings.
917. Edwin Maw, Doncaster Iron Works, Yorkshire—An improvement in the points of railway crossings.
919. Richard Archibald Brooman, 166, Fleet-street—Improvements in treating and bleaching fibrous vegetable substances, and in machinery employed therein. (A communication.)
921. Alfred Vincent Newton, 66, Chancery-lane—Improvements in repeating fire-arms. (A communication.)

Dated 3rd April, 1857.

923. William Henry Box, East Looe, Cornwall—An improved fish hook.
925. Stephen Barker, Birmingham—An improvement or improvements in the manufacture of steel.
927. Richard Archibald Brooman, 166, Fleet-street—A machine for the manufacture of bolts and rivets. (A communication.)
929. David Joy, Leeds—Improvements in steam engines.
931. Thomas Craddock, 137, Tachbrook-street, Pimlico—Certain improvements in the steam engine and steam boiler.
923. Felix Marie Baudouin, Paris—Improvements in the wires or conductors of electric telegraphs, and in the machinery for the manufacture thereof.

INVENTION WITH COMPLETE SPECIFICATION FILED.

983. Jean François Victor Larnaudès, 2, Rue Gabrielle, Montmartre, near Paris—For the disinfection and deodorisation of animal and vegetable substances.—8th April, 1857.

WEEKLY LIST OF PATENTS SEALED.

April 17th.

2419. Edward Tombs.
2421. Ferdinando Foggi.
2449. Charles Humfrey.
2450. Joseph Harrison.
2454. James Young.
2457. John Thomas Forster.
2468. Peter Armand le Comte de Fontainemoreau.
2489. Nehemiah Brough.
2498. George White.
2551. Constantine John Baptist Torassa.
2622. William Spence.
2700. Nicolas Pierre Joseph Leseure.
2948. Louis Joseph Frédéric Marguerite.
334. Henry Smith.

April 21st.

2470. William Smith.
2480. Godfrey Ermen.
2485. John Francis Porter.
2488. John Macdonald.
2490. Albert Demerit Bishop.
2491. Theophilus Horrex.
2497. Isaac Bailey.
2530. Joseph Armstrong.
2548. David H. Whittemore.
2570. Thomas Ainsley Cook.
2574. William Joseph Curtis.
2576. Samuel Tearne and George William Richmond.
2577. James Nasmyth and Robert Wilson.
2580. Eugene Napoléon Cadet.
2596. Charles Titterton.
2598. William Edward Newton.
2600. Herbert Keeling.
2609. George Collier.
2625. Louis Joseph Victor Vuitton.
2633. William Morphet.
2638. Rd. Archibald Brooman.
2657. Julian Bernard.
2674. Charles Wastell Dixey.
2680. John Kinniburgh.
2734. William Edward Newton.
241. David Yoolow Stewart.
341. James Gilroy.
454. John Henry Johnson.
473. Hector Christie.
488. Thomas Clayton.
510. John Henry Johnson.
545. Alexander Mitchell.
547. William Wood.
555. John Henry Johnson.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

April 13th.

871. Henry Meyer.

April 14th.

916. Frederick Buonaparte Anderson.

April 15th.

877. Frederic Barnett.
890. Julian Bernard.
891. Julian Bernard.

April 16th.

894. Henry Hucks Gibbs.
897. Jean François Felix Challeton.
924. Henry Bernoulli Barlow.

April 18th.

892. John Rowley.
935. Moses Poole.
960. Joseph Barling.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
3970	April 16.	Sanspareil Shirt	George Edmund Oldham	60, Mortimer-street, Cavendish-square.
3971	„ 20.	Signal Lantern	Henry James Pemberton	9, University-street, Tottenham-court-road.